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by examination of the observations of N.P.D., an inequality in the inclination expressed by

$$-2''\cdot 02 \times \text{sine longitude of node.}$$

And in the extension of this discussion, including the results of observations from 1750 to 1851, printed in Volume XXIX. of the *Memoirs*, I have found on page 21,

$$-1''\cdot 87 \times \text{sine longitude of node.}$$

It is very probable that these terms may have originated, at least in part, in erroneous value of the semidiameter employed in the reductions.

It is proper to remark that any important error in refraction, applying with different magnitudes to the summer observations and the winter observations, will mix its effects with those of erroneous semidiameter.

Royal Observatory, Greenwich,
1871, *November* 15.

On the Geodesic Lines on an Ellipsoid. By Prof. Cayley.

(Abstract.)

The fundamental equations in regard to the geodesic lines on an ellipsoid were established by Jacobi, viz., representing by a, b, c, the squares of the semiaxes, that is, taking the ellipsoid to be

$$\frac{x^2}{a} + \frac{y^2}{b} + \frac{z^2}{c} = 1,$$

(where $a > b > c$), if we introduce the elliptic co-ordinates h, k, and write

$$\frac{x^2}{a+h} + \frac{y^2}{b+h} + \frac{z^2}{c+h} = 1,$$

$$\frac{x^2}{a+k} + \frac{y^2}{b+k} + \frac{z^2}{c+k} = 1,$$

or, what is the same thing,

$$x^2 = \frac{a\,(a+h)(a+k)}{(a-b)(a-c)},$$

$$y^2 = \frac{b\,(b+h)(b+k)}{(b-c)(b-a)},$$

$$z^2 = \frac{c\,(c+h)(c+k)}{(c-a)(c-b)},$$

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then, if β be an arbitrary constant, the differential equation of a geodesic line is

$$(1).\quad \text{Const.} = \int dh \sqrt{\frac{h}{(a+h)(b+h)(c+h)(\beta+h)}} + \int dk \sqrt{\frac{h}{(a+k)(b+k)(c+k)(\beta+k)}},$$

and the expression for the length of any arc of the curve is given by

$$(2).\quad s = \int dh \sqrt{\frac{h\,(\beta+h)}{(a+h)(b+h)(c+h)}} + \int dk \sqrt{\frac{k\,(\beta+k)}{(a+k)(b+k)(c+k)}}.$$

I propose in the present memoir to develope the theory to the extent of showing how we can, by means of the first of these equations, explain the course of the geodesic lines; and for given numerical values of a, b, c, calculate, construct, and exhibit in a drawing, the course of these lines. I attend more particularly to the series of geodesic lines through an umbilicus (which lines pass also through the opposite umbilicus) and to the case where the semiaxes are connected by the equation $a\,c - b^2 = 0$, a relation which simplifies the formulæ.

On the Floor of Plato. By W. R. Birt, Esq.

I have just completed an examination of 133 observations of the tints of the floor of *Plato* by different observers, which has yielded the accompanying curve, and thinking it might be interesting to the Society, I have the pleasure of forwarding it for communication. The observations have been made in accordance with the annexed Form, a light tint having a value of 0·33, medium 0·50, and dark 0·66, higher or lower values have been used to express a very dark or a very light floor. It has long been known that the grey plains appear darkest under a high Sun, but I am not aware that any attempt has hitherto been made to exhibit graphically the progression of tint, and to show its connection with that of the Sun's altitude, which the two curves do unmistakably. The dotted curve is that of the Sun's altitude on the parallel of 50° at the equinoxes, the continuous curve that of the progression of tint, the inflexions of which indicate rather considerable variability, especially in the deepening of the tint. One remarkable feature is, that the chromatic curve lies almost wholly within that of altitude, from which it may be inferred that the full effect of the Sun's influence is scarcely attained, and that the average state of the floor of *Plato* is somewhat *lighter* than it

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Observations. Date

Instrument Power

Border

Floor

No. 1.
,, 3.
,, 4.
,, 5.
,, 6.
,, 7.
*,, 13.
,, 14.
,, 14.
,, 16.
,, 17.
*,, 19.
*,, 22.

* These spots should be particularly sought for.

Remarks

Observer

Lunar Occultations and Eclipses of Jupiter's Satellites.

By John Tebbutt, Esq.

I herewith send a list of lunar occultations and eclipses of *Jupiter's* satellites observed by me at Windsor. The first-mentioned phenomena were not previously computed, so that I was unable, except in two or three instances, to observe the reappearances. A few only of the stars are to be found in the Occultation-List of the *Nautical Almanac*, or in the Catalogues in my possession; but the magnitude of each star and its roughly estimated position, when in contact with the Moon's limb, are given in order to facilitate its future identification. With the exception of the observation of May 18, 1864, all the occultations were observed with my 4-feet refractor and a power of 30. The eclipses of *Jupiter's* satellites were observed with the same telescope, but with a power of 120. The chronometer on the 12th April and 18th May, 1864, was regulated from sextant observations, but on all other occasions with the transit-instrument. It is hoped that the list of occultations may hereafter prove useful for the accurate determination of the longitude of the Observatory, and hence serve for a verification of that of the Sydney Observatory. In conclusion, I may state that the latitude of my Observatory, as finally deduced from a large number of prime vertical observations of stars whose positions have been accurately determined in southern observatories, is $-33^\circ\,36'\,29''\cdot2$.

Paramatta, N.S. Wales, Sept. 26th, 1871.